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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,985	06/20/2003	Kurt R. Carlson	NGC-139/000009-199	7136

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EXAMINER	
KALIVODA, CHRISTOPHER M	
ART UNIT	**PAPER NUMBER**
2883	

DATE MAILED: 04/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/600,985	CARLSON ET AL.	
	Examiner	Art Unit	
	Christopher M. Kalivoda	2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 6-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 6-40* is/are rejected.

7)☒ Claim(s) *14 and 25* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *01/24/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

Claim 14 is objected to because of the following informalities: In line 2, the word microspheres should be microballons.

Claim 25 is objected to because of the following informalities: In line 2, the word microspheres should be microballons. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4 and 6-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cordova et al., U.S. Patent 5,546,482 in view of Brooker et al., European Patent Application 0 660 082.

Regarding independent claims 1, 15, 17 and 31 as claimed, Cordova et al. teaches an apparatus and method comprising a polymeric potting material (abstract lines 1-3 and Fig 2, ref sign 16) that encapsulates a fiber optic sensing coil of a fiber

optic gyroscope (abstract, lines 1-3 and col 3, lines 41-43, Fig 1, ref sign 10). The fibers are wound about a spool (Fig 2, ref sign 14) to form the fiber optic sensing coil (Fig 1, ref sign 10) that comprises a plurality of layers of the fiber optic cable (Fig 2). The polymeric potting material holds together the layers of the fiber optic sensing coil wound as a unit (col 4, lines 38-40).

However, the reference is silent with respect to the polymeric potting material comprising a plurality of introduced voids that promote an increase in compressibility of the polymeric potting material wherein upon introduction of an applied force to a portion of the polymeric potting material, the introduced voids compress to allow a portion of the polymeric material to absorb a portion of the applied force a promote a decrease of a reaction force from a portion of the polymeric potting material to the fiber optic sensing coil. It is also silent with respect to the plurality of introduced voids compressing to decrease a strain on the fiber optic sensing coil wherein the decrease in strain on the fiber optic sensing coil promotes a decrease in a bias error of the fiber optic sensing coil.

Brooker et al. teach a potting material that encapsulates a fiber optic sensing coil (abstract, lines 1-2) comprising a plurality of introduced voids that promote an increase in compressibility of the potting material (col 7, lines 39-42 where voids are bubbles) wherein upon introduction of an applied force to a portion of a potting material (col 7, lines 24-29), the introduced voids compress to allow a portion of the potting material to absorb a portion of the applied force and promote a decrease of a reaction force from a portion of the potting material to the fiber optic sensing coil. Since the structure is

present, the introduced voids also compress to decrease a strain on the fiber optic sensing coil wherein the decrease in strain on the fiber optic sensing coil promotes a decrease in a bias error of the fiber optic sensing coil.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Cordova et al., and include the plurality of introduced voids that promote an increase in compressibility of the potting material as taught by Brooker et al. for the purpose of reducing the pressure experienced by the coil (col 7, lines 24-29).

Regarding claims 2 and 22, the compression of the voids promotes a decrease in reaction force from the polymeric potting material to the sensing coil and the strain of the fiber optic sensing coil due to contact with the polymeric potting material since the structure (polymer potting material with compressible voids) as claimed is present.

Regarding claims 3 and 4, the plurality of voids promotes a decrease in the bulk modulus of the polymeric potting material since structure/voids as claimed is present. In addition, Cordova et al. teach environmental effects can introduce error (col 1, lines 35-39) so upon a change in temperature (Brooker et al., col 7, lines 24-29), the voids promote a decrease in thermal pressure induced on the fiber optic sensing coil since the structure as claimed is present.

Regarding claims 6, 16, 18, 21 and 29, Cordova et al. teaches a wound fiber optic sensing coil with one or more fibers wound in a plurality of layers (col 3, lines 46-49 and col 4, lines 42-46 and Fig 2) comprising a first coil portion and a second coil portion wherein a portion of the polymeric potting compound separates the first and

second portions (Fig 2) and wherein a portion of the polymeric potting compound comprises one or more of a plurality of voids as described above. The polymeric potting material is applied contemporaneously with winding the sensor fiber onto the sensor coil (col 4, lines 42-46). The plurality of voids compress to allow the portion of the polymeric potting material to absorb a portion of the applied force (as described above) from one or more of the first coil portion and second coil portion which also reduces pressure between the between the layers since the structure as claimed is present.

Regarding claims 7 and 8, the voids compress to promote the decrease of the reaction force from the portion of the polymeric potting material to the first coil portion wherein the reaction force is generated in response to the applied force from the second coil portion or wherein the reaction force is generated in response to the applied force from the first coil portion since the structure as claimed is present.

Regarding claims 9 and 19, upon expansion of the fiber optic sensing coil, the first coil portion and second coil portion exert the applied force on the polymeric potting material, the voids compress to reduce the strain in the first coil portion and second coil portion since the structure as claimed is present.

Regarding claim 10, the first and second coil portions comprise adjacent layers of the fiber optic sensing coil and are separated by a distance (Cordova et al. Fig 2) and the diameter of the introduced voids/bubbles is smaller than the distance since the voids compress to absorb force as described above.

Regarding claim 11, while the reference does not specifically state the plurality of voids is uniform, one skilled in the art would make the void distribution uniform for the purpose of evenly distributing the applied force and have an overall symmetric design.

Regarding claim 12, Cordova et al. teach the fiber optic sensing coil is used in a fiber optic gyroscope (col 1, line 11) to sense a rate of rotation (col 1, lines 31-34).

Regarding claim 13, the compression of the voids promotes a decrease in a rotation sensing bias error of the fiber optic gyroscope through a promotion of a decrease in pressure exerted on the fiber optic sensing coil by the polymeric material since the claimed structure is present as described above.

Regarding claim 20, Cordova et al. teach the fiber optic sensing coil is used in a fiber optic gyroscope (col 1, line 11) to sense a rate of rotation (col 1, lines 31-34). The voids promote a decrease in a rotation sensing bias error of the fiber optic gyroscope through a promotion of a decrease in pressure (col 7, lines 24-25 and 39-42) exerted on the fiber optic sensing coil by the polymeric potting material since the claimed structure is present as described above.

Regarding claims 14, 23, 28, 30 and 32, Cordova et al. in view of Brooker et al. teach the limitations of claims 1, 15, 17 and 31 as described above.

In addition, Brooker et al. teach the plurality of voids/bubbles can comprise a plurality of hollow elastomeric microballoons (col 7, lines 53-58). Since they are hollow microballoons, they have thin walls and encapsulate a gas. They also allow for compression since the microballons replace the voids, which promote compressibility (col 7, lines 39-42). The hollow elastomeric microballoons can be mixed into the resin

of the polymeric material to create the plurality of introduced voids since they can replace the voids/air bubbles as described above and substantially all the fiber optic sensing coil is potted within the potting material to hold the fiber sensing coil as a wound unit (Cordova, et al., Fig 2).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Cordova et al. in view of Brooker et al. which incorporates a plurality of voids and replace the voids in the Cordova et al. potting material with a plurality of hollow elastomeric microballoons as taught by Brooker et al. by mixing them into the resin of the polymeric material and potting all of the coil to hold the fiber sensing coil as a wound unit for the purpose of adjusting the specific gravity (Brooker et al. col 7, lines 43-44) in order to reduce spurious output signals (Brooker et al., col 7, lines 47-53) or reduce the pressure on the coil (col 7, lines 24-29).

Regarding claim 24, the thin wall of the plurality of hollow elastomeric microballoons preserve a volume within the polymeric potting material since they have size (micro-sized) and are distributed in the potting material. Upon introduction of an applied force, the thin walls of the microballoons compress to reduce the volume of the microballoons since the microballoons replace the voids, which were included to promote compressibility (Brooker et al., col 7, lines 39-42).

Regarding claim 25, there is a coupling agent (Cordova et al. col 4, lines 38-40 and Fig 2, ref sign 16) adhering to the thin walls of the microballoons with a resin of the polymeric potting material.

Regarding claims 26 and 27, the sensing coil comprises a plurality of layers of fiber optic cable wound about a spool (Cordova et al, col 3, lines 46-49 and Fig 2). The polymeric potting material holds together the plurality of layers of the sensing coil as a wound unit (col 4, lines 38-40). In addition, the polymeric potting material holds a position of a first layer of the plurality of layers relative to an adjacent layer of the plurality of layers in the wound unit (col 4, lines 38-43 and Fig 2). The voids promote compressibility of the polymeric potting material that holds the position of the first layer relative to the adjacent layer as described above.

Regarding claims 33-40, Cordova et al., in view of Brooker et al, teach the limitations of claims 1, 15, 17 and 31 as described above. In addition, the polymeric material comprises naturally occurring voids and a plurality of introduced voids (Brooker et al., col 7, lines 29-42). The voids are bubbles or microballoons (col 7, lines 29-42 and lines 53-58) and fill a controlled percentage (col 8, lines 12-17) of the material.

However, the reference is silent with respect to the controlled volume percentage being 5-25 percent of the polymeric potting material.

It is not inventive to discover the optimum or workable ranges by routine experimentation (see MPEP 2144.04; In re Aller, 220 F2.d 454, 456, 105 USPQ 233, 235).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to control the volume percentage between 5-25 percent for the purpose of reducing the pressure on the coil (col 7, lines 24-29).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 5,444,534 to Dyott et al. describes a fiber-sensing coil in a gel comprising voids or microballoons.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher M. Kalivoda whose telephone number is (571) 272-2476. The examiner can normally be reached on Monday - Friday (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

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cmk

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